What is claimed is:

1. A system for detecting an analyte in a fluid comprising:

a light source;

a sensor array, the sensor array comprising a supporting member comprising at least one cavity formed within the supporting member;

a particle, the particle positioned within the cavity, wherein the particle is configured to produce a signal when the particle interacts with the analyte during use; and

a detector, the detector being configured to detect the signal produced by the interaction of the analyte with the particle during use;

wherein the light source and detector are positioned such that light passes from the light source, to the particle, and onto the detector during use.

2. The system of claim 1, wherein the system comprises a plurality of particles positioned within a plurality of cavities, and wherein the system is configured to substantially simultaneously detect a plurality of analytes in the fluid.

3. The system of claim 1, wherein the system comprises a plurality of particles positioned within the cavity.

4. The system of claim 1, wherein the light source comprises a light emitting diode.

5. The system of claim 1, wherein the light source comprises a white light source.

6. The system of claim 1, wherein the sensor array further comprises a bottom layer and a top cover layer, wherein the bottom layer is coupled to a bottom surface of the supporting member, and wherein the top cover layer is coupled to a top surface of the supporting member; and wherein both the bottom layer and the top cover layer are coupled to the supporting member such that the particle is substantially contained within the cavity by bottom layer and the top cover layer.

7. The system of claim 1, wherein the sensor array further comprises a bottom layer and a top cover layer, wherein the bottom layer is coupled to a bottom surface of the supporting member, and wherein the top cover layer is coupled to a top surface of the supporting member; and wherein both the bottom layer and the top cover layer are coupled to the supporting member such that the particle is substantially contained within the cavity by bottom layer and the top cover layer, and wherein the bottom layer and the top cover layer are substantially transparent to light produced by the light source.

8. The system of claim 1, wherein the sensor array further comprises a bottom layer coupled to the supporting member, and wherein the supporting member comprises silicon, and wherein the bottom layer comprises silicon nitride.

9. The system of claim 1, wherein the sensor array further comprises a sensing cavity formed on a bottom surface of the sensor array.

10. The system of claim 1, wherein the supporting member is formed from a plastic material, and wherein the sensor array further comprises a top cover layer, the top cover layer being coupled to the supporting member such that the particle is substantially contained within the cavity, and wherein the top cover layer is configured to allow the fluid to pass through the top cover layer to the particle, and wherein both the supporting member and the top cover layer are substantially transparent to light produced by the light source.

11. The system of claim 1, further comprising a fluid delivery system coupled to the supporting member.

12. The system of claim 1, wherein the detector comprises a charge-coupled device.

13. The system of claim 1, wherein the detector comprises an ultraviolet detector.

14. The system of claim 1, wherein the detector comprises a fluorescence detector.

15. The system of claim 1, wherein the detector comprises a semiconductor based photodetector, and wherein the detector is coupled to the sensor array.

16. The system of claim 1, wherein the particle ranges from about 0.05 micron to about 500 microns.

17. The system of claim 1, wherein a volume of the particle changes when contacted with the fluid.

18. The system of claim 1, wherein the particle comprises a metal oxide particle.

19. The system of claim 1, wherein the particle comprises a metal quantum particle.

20. The system of claim 1, wherein the particle comprises a semiconductor quantum particle.

21. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin.

22. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the polymeric resin comprises polystyrene-polyethylene glycol-

divinyl benzene.

23. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the receptor molecule produces the signal in response to the pH of the fluid.

24. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the analyte comprises a metal ion, and wherein the receptor produces the signal in response to the presence of the metal ion.

25. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the analyte comprises a carbohydrate, and wherein the receptor produces a signal in response to the presence of a carbohydrate.

26. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the particles further comprises a first indicator and a second indicator, the first and second indicators being coupled to the receptor, wherein the interaction of the receptor with the analyte causes the first and second indicators to interact such that the signal is produced.

27. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the particles further comprises an indicator, wherein the indicator is associated with the receptor such that in the presence of the analyte the indicator is displaced from the receptor to produce the signal.

28. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the receptor comprises a polynucleotide.

29. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a

polymeric resin, and wherein the receptor comprises a peptide.

30. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the receptor comprises an enzyme.

31. The system o f claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the receptor comprises a synthetic receptor.

32. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the receptor comprises an unnatural biopolymer.

33. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the receptor comprises an antibody.

34. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the receptor comprises an antigen.

35. The system of claim 1, wherein the analyte comprises phosphate functional groups, and wherein the particle is configured to produce the signal in the presence of the phosphate functional groups.

36. The system of claim 1, wherein the analyte comprises bacteria, and wherein the particle is configured to produce the signal in the presence of the bacteria.

37. The system of claim 1, wherein the system comprises a plurality of particles positioned within a plurality of cavities, and wherein the plurality of particles produce a detectable pattern in the presence of the analyte.

38. The system of claim 1, wherein the supporting member comprises silicon.

39. The system of claim 1, wherein the sensor array further comprises a top cover layer, wherein the top cover layer is coupled to a top surface of the supporting member such that the particle is substantially contained within the cavity by the top cover layer.

40. The system of claim 1, wherein the sensor array further comprises a bottom layer coupled to the supporting member, and wherein the bottom layer comprises silicon nitride.

41. The system of claim 1, wherein the particles produce a detectable pattern in the presence of the analyte.

42. The system of claim 1, wherein the cavity is configured such that the fluid entering the cavity passes through the supporting member during use.

43. The system of claim 1, wherein the light source comprises a red light emitting diode, a blue light emitting diode, and a green light emitting diode.

44. The system of claim 1, wherein the sensor array further comprises a cover layer coupled to the supporting member and a bottom layer coupled to the supporting member, wherein the cover layer and the bottom layer are removable.

45. The system of claim 1, wherein the sensor array further comprises a cover layer coupled to the supporting ,member and a bottom layer coupled to the supporting member, wherein the cover layer and the bottom layer are removable, and wherein the cover layer and the bottom layer include openings that are substantially aligned with the cavities during use.

46. The system of claim 1, wherein the sensor array further comprises a cover layer coupled to the supporting member and a bottom layer coupled to the supporting member, wherein the bottom layer is coupled to a bottom surface of the supporting member and wherein the cover

layer is removable, and wherein the cover layer and the bottom layer include openings that are substantially aligned with the cavities during use.

47. The system of claim 1, wherein the sensor array further comprises a cover layer coupled to the supporting member and a bottom layer coupled to the supporting member, wherein an opening is formed in the cover layer substantially aligned with the cavity, and wherein an opening is formed in the bottom layer substantially aligned with the cavity.

48. The system of claim 1, wherein the cavity is substantially tapered such that the width of the cavity narrows in a direction from a top surface of the supporting member toward a bottom surface of the supporting member, and wherein a minimum width of the cavity is substantially less than a width of the particle.

49. The system of claim 1, wherein a width of a bottom portion of the cavity is substantially less than a width of a top portion of the cavity, and wherein the width of the bottom portion of the cavity is substantially less than a width of the particle.

50. The system of claim 1, wherein the sensor array further comprises a cover layer coupled to the supporting member and a bottom layer coupled to the supporting member, wherein the bottom layer is configured to support the particle, and wherein an opening is formed in the cover layer substantially aligned with the cavity.

51. The system of claim 1, further comprising a removable cover layer.

52. The system of claim 1, wherein the supporting member comprises a plastic material.

53. The system of claim 1, wherein the supporting member comprises a silicon wafer.

54. The system of claim 1, wherein the supporting member comprises a dry film photoresist

material.

55. The system of claim 1, wherein the supporting member comprises a plurality of layers of a dry film photoresist material.

56. The system of claim 1, wherein an inner surface of the cavity is coated with a reflective material.

57. The system of claim 1, further comprising channels in the supporting member, wherein the channels are configured to allow the fluid to flow through the channels into and away from the cavity.

58. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use.

59. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump.

60. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump, and wherein the pump comprises an electrode pump.

61. The system of claim 1 wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump, and wherein the pump comprises a piezoelectric pump.

62. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump, and wherein the pump comprises a pneumatic activated pump.

63. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump, and wherein the pump comprises a heat activated pump.

64. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump, and wherein the pump comprises a peristaltic pump.

65. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the

pump comprises a diaphragm pump, and wherein the pump comprises an electroosmosis pump.

66. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump, and wherein the pump comprises an electrohydrodynamic pump.

67. The system of claim 1, wherein the sensor array further comprises a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity, and wherein a channel is formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump, and wherein the pump comprises an electroosmosis pump and an electrohydrodynamic pump.

68. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the particle further comprises a first indicator and a second indicator, the first and second indicators being coupled to the receptor, wherein the interaction of the receptor with the analyte causes the first and second indicators to interact such that the signal is produced.

69. The system of claim 1, wherein the particle comprises a receptor molecule coupled to a polymeric resin, and wherein the particle further comprises an indicator, wherein the indicator is associated with the receptor such that in the presence of the analyte the indicator is displaced from the receptor to produce the signal.

70. The system of claim 1, wherein a portion of the supporting member is substantially transparent to a portion of light produced by the light source.

71. The system of claim 1, wherein the particle is coupled to the supporting member with via an adhesive material.

72. The system of claim 1, wherein the particle are coupled to the supporting member via a gel material.

73. The system of claim 1, wherein the particle is suspended in a gel material, the gel material covering a portion of the supporting member, and wherein a portion of the particle extends from the upper surface of the gel.

74. The system of claim 1, wherein the sensor array further comprises a cover coupled to the supporting member, positioned above the particle, wherein a force exerted by the cover on the particle inhibits the displacement of the particle from the supporting member.

75. The system of claim 1, wherein the supporting member comprises glass.

76. The system of claim 1, wherein the supporting member is composed of a material substantially transparent to ultraviolet light.

77. The system of claim 1, further comprising a conduit coupled to the sensor array, wherein the conduit is configured to conduct the fluid sample to and away from the sensor array; and a vacuum chamber coupled to the conduit, wherein the vacuum chamber comprises a breakable barrier positioned between the chamber and the conduit, and wherein the chamber is configured to pull the fluid through the conduit when the breakable barrier is punctured.

78. The system of claim 1, further comprising a conduit coupled to the sensor array, wherein the conduit is configured to conduct the fluid sample to and away from the sensor array; and a vacuum chamber coupled to the conduit, wherein the vacuum chamber comprises a breakable

barrier positioned between the chamber and the conduit, and wherein the chamber is configured to pull the fluid through the conduit when the breakable barrier is punctured, and further comprising a filter coupled to the conduit and the sensor array, wherein the fluid passes through the filter before reaching the sensor array.

79. The system of claim 1, further comprising a conduit coupled to the sensor array, wherein the conduit is configured to conduct the fluid sample to and away from the sensor array; and a vacuum chamber coupled to the conduit, wherein the vacuum chamber comprises a breakable barrier positioned between the chamber and the conduit, and wherein the chamber is configured to pull the fluid through the conduit when the breakable barrier is punctured, and further comprising a filter coupled to the conduit and the sensor array, wherein the fluid passes through the filter before reaching the sensor array, and wherein the fluid is a blood sample, and wherein the filter comprises a membrane for the removal of particulates.

80. The system of claim 1, further comprising a conduit coupled to the sensor array, wherein the conduit is configured to conduct the fluid sample to and away from the sensor array; and a vacuum chamber coupled to the conduit, wherein the vacuum chamber comprises a breakable barrier positioned between the chamber and the conduit, and wherein the chamber is configured to pull the fluid through the conduit when the breakable barrier is punctured, and further comprising a filter coupled to the conduit and the sensor array, wherein the fluid passes through the filter before reaching the sensor array, and wherein the fluid is a blood sample, and wherein the filter comprises a membrane for removal of white and red blood cells from the blood.

81. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal.

82. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of

the analyte to produce a signal, and wherein the chemical reaction comprises cleavage of the biopolymer by the analyte.

83. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the biopolymer comprises a peptide, and wherein the analyte comprises a protease, and wherein the chemical reaction comprises cleavage of the peptide by the protease.

84. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the biopolymer comprises a polynucleotide, and wherein the analyte comprises a nuclease, and wherein the chemical reaction comprises cleavage of the polynucleotide by the nuclease.

85. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the biopolymer comprises an oligosaccharide, and wherein the analyte comprises an oligosaccharide cleaving agent, and wherein the chemical reaction comprises cleavage of the oligosaccharide by the oligosaccharide cleaving agent.

86. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises a first indicator and a second indicator, the first and second indicators being coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the signal is produced.

87. The system of claim 1, wherein the particle comprises a biopolymer coupled to a

polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises a first indicator and a second indicator, the first and second indicators being coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the signal is produced, and wherein the first indicator is a fluorescent dye and wherein the second indicator is a fluorescent quencher, and wherein the first indicator and the second indicator are within the Föster energy transfer radius, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the first and second indicators to move outside the Föster energy transfer radius.

88. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises a first indicator and a second indicator, the first and second indicators being coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the signal is produced. wherein the first indicator is a fluorescent dye and wherein the second indicator is a different fluorescent dye, and wherein the first indicator and the second indicator produce a fluorescence resonance energy transfer signal, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the positions of the first and second indicators to change such that the fluorescence resonance energy transfer signal is altered.

89. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and further comprising an indicator coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the biopolymer to be cleaved such that a portion of the biopolymer coupled to the indicator is cleaved from a portion of the biopolymer coupled to the polymeric resin.

90. The system of claim 1 wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises an indicator coupled to the particle, and wherein the chemical reaction causes a change to a biopolymer such that the interaction of the indicator with the biopolymer is altered to produce the signal.

91. The system of claim 1, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises an indicator coupled to the particle, and wherein the chemical reaction causes a change to the biopolymer and the indicator to produce the signal.

92. The system of claim 1, wherein the particle comprises a receptor coupled to a polymeric resin, and a probe molecule coupled to the polymeric resin, and wherein the probe molecule is configured to produce a signal when the receptor interacts with the analyte during use.

93. The system of claim 1, wherein the particle comprises a receptor coupled to a polymeric resin, and a probe molecule coupled to the polymeric resin, and wherein the probe molecule is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the particles further comprises an additional probe molecule coupled to the polymeric resin, wherein the interaction of the receptor with the analyte causes the probe molecules to interact such that the signal is produced.

94. A system for detecting an analyte in a fluid comprising:

a light source;

a sensor array, the sensor array comprising:

a supporting member; wherein a first cavity and a second cavity are formed within the supporting member;

a first particle positioned within the first cavity;

a second particle positioned within the second cavity, wherein the second particle comprises a reagent, wherein a portion of the reagent is removable from the second particle when contacted with a decoupling solution, and wherein the reagent is configured to modify the first particle, when the reagent is contacted with the first particle, such that the first particle will produce a signal when the first particle interacts with the analyte during use;

a first pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the first cavity;

a second pump coupled to the supporting member, wherein the second pump is configured to direct the decoupling solution towards the second cavity;

wherein a first channel is formed in the supporting member, the first channel coupling the first pump to the first cavity such that the fluid flows through the first channel to the first cavity during use, and wherein a second channel is formed in the supporting member, the second channel coupling the second cavity to the first cavity such that the decoupling solution flows from the second cavity through the second channel to the first cavity during use; and

a detector, the detector being configured to detect the signal produced by the interaction of the analyte with the particle during use;

wherein the light source and detector are positioned such that light passes from the light

source, to the particle, and onto the detector during use.

95. The system of claim 94, wherein the sensor array further comprises a plurality of additional particles positioned within a plurality of additional cavities, and wherein the system is configured to substantially simultaneously detect a plurality of analytes in the fluid, and wherein the second cavity is coupled to the additional cavities such that the reagent may be transferred from the second particle to the additional cavities during use.

96. The system of claim 94, wherein the first particle comprises an indicator molecule coupled to a first polymeric resin, and the second particle comprises a receptor molecule coupled to a second polymeric resin.

97. The system of claim 94, wherein the first particle comprises a first polymeric resin configured to bind to the receptor molecule, and wherein the second particle comprises the receptor molecule coupled to a second polymeric resin.

98. The system of claim 94, wherein the sensor array further comprises a reservoir coupled to the second pump, the reservoir configured to hold the decoupling solution.

99. A system for detecting an analyte in a fluid comprising:

a light source;

a sensor array, the sensor array comprising at least one particle coupled to the sensor array, wherein the particle is configured to produce a signal when the particle interacts with the analyte; and

a detector configured to detect the signal produced by the interaction of the analyte with the particle;

wherein the light source and detector are positioned such that light passes from the light source, to the particle, and onto the detector during use.

100. A sensor array for detecting an analyte in a fluid comprising:

a supporting member; wherein at least one cavity is formed within the supporting member;

a particle positioned within the cavity, wherein the particle is configured to produce a signal when the particle interacts with the analyte.

101. The sensor array of claim 100, further comprising a plurality of particles positioned within the cavity.

102. The sensor array of claim 100, wherein the particle comprises a receptor molecule coupled to a polymeric resin.

103. The sensor array of claim 100, wherein the particle has a size ranging from about 0.05 micron to about 500 microns in diameter.

104. The sensor array of claim 100, wherein the particle has a size ranging from about 0.05 micron to about 500 microns in diameter, and wherein the cavity is configured to substantially contain the particle.

105. The sensor array of claim 100, wherein the supporting member comprises a plastic material.

106. The sensor array of claim 100, wherein the supporting member comprises a silicon wafer.

107. The sensor array of claim 100, wherein the cavity extends through the supporting member.

108. The sensor array of claim 100, wherein the supporting member comprises a silicon wafer, and wherein the cavity is substantially pyramidal in shape and wherein the sidewalls of the cavity are substantially tapered at an angle of between about 50 to about 60 degrees.

109. The sensor array of claim 100, wherein the supporting member comprises a silicon wafer, and further comprising a substantially transparent layer positioned on a bottom surface of the silicon wafer.

110. The sensor array of claim 100, wherein the supporting member comprises a silicon wafer, and further comprising a substantially transparent layer positioned on a bottom surface of the silicon wafer, wherein the substantially transparent layer comprises silicon dioxide, silicon nitride, or silicon oxide/silicon nitride multilayer stacks.

111. The sensor array of claim 100, wherein the supporting member comprises a silicon wafer, and further comprising a substantially transparent layer positioned on a bottom surface of the silicon wafer, wherein the substantially transparent layer comprises silicon nitride.

112. The sensor array of claim 100, wherein the supporting member comprises a silicon wafer, and wherein the silicon wafer has an area of about 1 $cm^2$ to about 100 $cm^2$.

113. The sensor array of claim 100, further comprising a plurality of cavities formed in the silicon wafer, and wherein from about 10 to about $10^6$ cavities are formed in the silicon wafer.

114. The sensor array of claim 100, further comprising channels in the supporting member, wherein the channels are configured to allow the fluid to flow through the channels into and

away from the cavity.

115. The sensor array of claim 100, further comprising an inner surface coating, wherein the inner surface coating is configured to inhibit dislodgment of the particle.

116. The sensor array of claim 100, further comprising a detector coupled to the bottom surface of the supporting member, wherein the detector is positioned below the cavity.

117. The sensor array of claim 100, further comprising a detector coupled to the bottom surface of the supporting member, wherein the detector is positioned below the cavity, and wherein the detector is a semiconductor based photodetector.

118. The sensor array of claim 100, further comprising a detector coupled to the bottom surface of the supporting member, wherein the detector is positioned below the cavity, and wherein the detector is a Fabry-Perot type detector.

119. The sensor array of claim 100, further comprising a detector coupled to the bottom surface of the supporting member, wherein the detector is positioned below the cavity, and further comprising an optical fiber coupled to the detector, wherein the optical fiber is configured to transmit optical data to a microprocessor.

120. The sensor array of claim 100, further comprising an optical filters coupled to a bottom surface of the sensor array.

121. The sensor array of claim 100, further comprising a barrier layer positioned over the cavity, the barrier layer being configured to inhibit dislodgment of the particle during use.

122. The sensor array of claim 100, further comprising a barrier layer positioned over the cavity, the barrier layer being configured to inhibit dislodgment of the particle during use, and

wherein the barrier layer comprises a substantially transparent cover plate positioned over the cavity, and wherein the cover plate is positioned a fixed distance over the cavity such that the fluid can enter the cavity.

123. The sensor array of claim 100, further comprising a barrier layer positioned over the cavity, the barrier layer being configured to inhibit dislodgment of the particle during use, and wherein the barrier layer comprises a substantially transparent cover plate positioned over the cavity, and wherein the cover plate is positioned a fixed distance over the cavity such that the fluid can enter the cavity, and wherein the barrier layer comprises plastic, glass, quartz, silicon oxide, or silicon nitride.

124. The sensor array of claim 100, further comprising a plurality of particles positioned within a plurality of cavities formed in the supporting member.

125. The sensor array of claim 100, wherein the system comprises a plurality of particles positioned within a plurality of cavities, and wherein the plurality of particles produce a detectable pattern in the presence of the analyte.

126. The sensor array of claim 100, further comprising channels in the supporting member, wherein the channels are configured to allow the fluid to flow through the channels into and away from the cavities, and wherein the barrier layer comprises a cover plate positioned upon an upper surface of the supporting member, and wherein the cover plate inhibits passage of the fluid into the cavities such that the fluid enters the cavities via the channels.

127. The sensor array of claim 100, further comprising a cover layer coupled to the supporting member and a bottom layer coupled to the supporting member, wherein the bottom layer is coupled to a bottom surface of the supporting member and wherein the cover layer is removable, and wherein the cover layer and the bottom layer include openings that are substantially aligned with the cavities during use.

128. The sensor array of claim 100, further comprising a cover layer coupled to the supporting member and a bottom layer coupled to the supporting member, wherein an opening is formed in the cover layer substantially aligned with the cavity, and wherein an opening is formed in the bottom layer substantially aligned with the cavity.

129. The sensor array of claim 100, wherein the cavity is substantially tapered such that the width of the cavity narrows in a direction from a top surface of the supporting member toward a bottom surface of the supporting member, and wherein a minimum width of the cavity is substantially less than a width of the particle.

130. The sensor array of claim 100, wherein a width of a bottom portion of the cavity is substantially less than a width of a top portion of the cavity, and wherein the width of the bottom portion of the cavity is substantially less than a width of the particle.

131. The sensor array of claim 100, further comprising a cover layer coupled to the supporting member and a bottom layer coupled to the supporting member, wherein the bottom layer is configured to support the particle, and wherein an opening is formed in the cover layer substantially aligned with the cavity.

132. The sensor array of claim 100, further comprising a removable cover layer coupled to the supporting member.

133. The sensor array of claim 100, wherein the supporting member comprises a dry film photoresist material.

134. The sensor array of claim 100, wherein the supporting member comprises a plurality of layers of a dry film photoresist material.

135. The sensor array of claim 100, wherein an inner surface of the cavity is coated with a reflective material.

136. The sensor array of claim 100, further comprising channels in the supporting member, wherein the channels are configured to allow the fluid to flow through the channels into and away from the cavity.

137. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use.

138. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a diaphragm pump.

139. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises an electrode pump.

140. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a piezoelectric pump.

141. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a pneumatic activated pump.

142. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a heat activated pump.

143. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises a peristaltic pump.

144. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises an electroosmosis pump.

145. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid

flows through the channel to the cavity during use, and wherein the pump comprises an electrohydrodynamic pump.

146. The sensor array of claim 100, further comprising a pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the cavity; and a channel formed in the supporting member, the channel coupling the pump to the cavity such that the fluid flows through the channel to the cavity during use, and wherein the pump comprises an electroosmosis pump and an electrohydrodynamic pump.

147. The sensor array of claim 100, wherein a width of a bottom portion of the cavity is substantially less than a width of a top portion of the cavity, and wherein the width of the bottom portion of the cavity is substantially less than a width of the particle.

148. A sensor array for detecting an analyte in a fluid comprising:

a supporting member; wherein a first cavity and a second cavity are formed within the supporting member;

a first particle positioned within the first cavity;

a second particle positioned within the second cavity, wherein the second particle comprises a reagent, wherein a portion of the reagent is removable from the second particle when contacted with a decoupling solution, and wherein the reagent is configured to modify the first particle, when the reagent is contacted with the first particle, such that the first particle will produce a signal when the first particle interacts with the analyte during use;

a first pump coupled to the supporting member, wherein the pump is configured to direct the fluid towards the first cavity;

a second pump coupled to the supporting member, wherein the second pump is configured to direct the decoupling solution towards the second cavity;

wherein a first channel is formed in the supporting member, the first channel coupling the first pump to the first cavity such that the fluid flows through the first channel to the first cavity during use, and wherein a second channel is formed in the supporting member, the second channel coupling the second cavity to the first cavity such that the decoupling solution flows from the second cavity through the second channel to the first cavity during use.

149. The sensor array of claim 148, wherein the first particle comprises a receptor molecule coupled to a first polymeric resin, and wherein the second particle comprises an indicator molecule coupled to a second polymeric resin.

150. The sensor array of claim 148, wherein the first particle comprises an indicator molecule coupled to a first polymeric resin, and the second particle comprises a receptor molecule coupled to a second polymeric resin.

151. The sensor array of claim 148, wherein the first particle comprises a first polymeric resin configured to bind to the receptor molecule, and wherein the second particle comprises the receptor molecule coupled to a second polymeric resin.

152. The sensor array of claim 148, further comprising a reservoir coupled to the second pump, the reservoir configured to hold the decoupling solution.

153. A sensor array for detecting an analyte in a fluid comprising:

at least one particle coupled to a supporting member, wherein the particle is configured to

produce a signal when the particle interacts with the analyte.

154. The sensor array of claim 153, wherein the particle is coupled to the supporting member with via an adhesive material.

155. The sensor array of claim 153, wherein the particle are coupled to the supporting member via a gel material.

156. The sensor array of claim 153, wherein the particle is suspended in a gel material, the gel material covering a portion of the supporting member, and wherein a portion of the particle extends from the upper surface of the gel.

157. The sensor array of claim 153, further comprising a cover positioned above the particle.

158. The sensor array of claim 153, further comprising a cover coupled to the supporting member, positioned above the particle, wherein a force exerted by the cover on the particle inhibits the displacement of the particle from the supporting member.

159. The sensor array of claim 153, wherein the particle comprises a receptor molecule coupled to a polymeric resin.

160. The sensor array of claim 153, wherein the supporting member comprises glass.

161. A method for forming a sensor array configured to detect an analyte in a fluid, comprising:

forming a cavity in a supporting member, wherein the supporting member comprises a silicon wafer;

placing a particle in the cavity, wherein the particle is configured to produce a signal when the particle interacts with the analyte; and

forming a cover upon a portion of the supporting member, wherein the cover is configured to inhibit dislodgment of the particle from the cavity.

162. The method of claim 161, wherein forming the cavity comprises anisotropically etching the silicon wafer.

163. The method of claim 161, wherein forming the cavity comprises anisotropically etching the silicon wafer with a wet hydroxide etch.

164. The method of claim 161, wherein forming the cavity comprises anisotropically etching the silicon wafer such that sidewalls of the cavity are tapered at an angle from about 50 degrees to about 60 degrees.

165. The method of claim 161, wherein the silicon wafer has an area of about 1 $cm^2$ to about 100 $cm^2$.

166. The method of claim 161, further comprising forming a substantially transparent layer upon a bottom surface of the silicon wafer below the cavity.

167. The method of claim 161, further comprising forming a substantially transparent layer upon a bottom surface of the silicon wafer, wherein the cavity extends through the silicon wafer and wherein the substantially transparent layer is positioned to support the particle.

168. The method of claim 161, wherein the substantially transparent layer comprises silicon nitride.

169. The method of claim 161, wherein the cover comprises plastic, glass, quartz, silicon nitride, or silicon oxide.

170. The method of claim 161, wherein forming the cover comprises coupling the cover to the silicon wafer at a distance above the silicon wafer substantially less than a width of the particle.

171. The method of claim 161, further comprising etching channels in the silicon wafer prior to forming the cover on the silicon wafer, wherein forming the cover comprises placing the cover against the upper surface of the silicon wafer, and wherein the channels are configured to allow the fluid to pass through the silicon wafer to and from the cavities.

172. The method of claim 161, further comprising coating an inner surface of the cavity with a material to increase adhesion of the particle to the inner surface of the cavity.

173. The method of claim 161, further comprising coating an inner surface of the cavity with a material to increase reflectivity of the inner surface of the cavity.

174. The method of claim 161, further comprising forming an optical detector upon a bottom surface of the supporting member below the cavity.

175. The method of claim 161, further comprising forming a sensing cavity upon a bottom surface of the supporting member below the cavity.

176. The method of claim 161, further comprising forming a sensing cavity upon a bottom surface of the supporting member below the cavity, and wherein forming the sensing cavity comprises:

forming a barrier layer upon a bottom surface of the silicon wafer;

forming a bottom diaphragm layer upon the barrier layer;

forming etch windows extending through the bottom diaphragm layer;

forming a sacrificial spacer layer upon the bottom diaphragm layer;

removing a portion of the spacer layer;

forming a top diaphragm layer; and

removing a remaining portion of the spacer layer.

177. The method of claim 161, further comprising forming an optical filter upon the bottom surface of the supporting member.

178. The method of claim 161, further comprising forming a plurality of cavities in the silicon wafer.

179. The method of claim 161, wherein from about 10 to about $10^6$ cavities are formed in the silicon wafer.

180. The method of claim 161, wherein the formed cavity is configured to allow the fluid to pass through the supporting member.

181. The method of claim 161, further comprising forming a substantially transparent layer upon a bottom surface of the supporting member below the cavity, wherein the bottom layer is configured to inhibit the displacement of the particle from the cavity while allowing the fluid to pass through the supporting member.

182. The system of claim 161, wherein a width of a bottom portion of the cavity is substantially less than a width of a top portion of the cavity, and wherein the width of the bottom portion of the cavity is substantially less than a width of the particle.

183. The method of claim 161, further comprising forming channels in the supporting member wherein the channels are configured to allow the fluid to pass through the supporting member to and from the cavity.

184. The method of claim 161, further comprising forming a pump on the supporting member, the pump being configured to pump the fluid to the cavity.

185. The method of claim 161, further comprising forming a cover, wherein forming the cover comprises:

forming a removable layer upon the upper surface of the supporting member;

forming a cover upon the removable layer;

forming support structures upon the supporting member, the support structures covering a portion of the cover; and

dissolving the removable layer.

186. The method of claim 161, wherein forming the cover further comprises forming openings in the cover, wherein the openings are substantially aligned with the cavity.

187. The method of claim 161, wherein the particles are placed in the cavities using a micromanipulator.

188. The method of claim 161, further comprising forming additional cavities within the supporting member, and further comprising placing additional particles in the additional cavities, wherein placing the additional particles in the additional cavities comprises:

placing a first masking layer on the supporting member, wherein the first masking layer covers a first portion of the additional cavities such that passage of a particle into the first portion of the additional cavities is inhibited, and wherein the first masking layer a second portion of the cavities substantially unmasked,;

placing the additional particles on the supporting member;

moving the additional particles across the supporting member such that the particles fall into the second portion of the cavities;

removing the first masking layer;

placing a second masking layer upon the supporting member, wherein the second masking layer covers the second portion of the cavities and a portion of the first portion of the cavities while leaving a third portion of the cavities unmasked;

placing additional particles on the supporting member; and

moving the additional particles across the supporting member such that the particles fall into the third portion of the cavities.

189. The method of claim 161, wherein forming the cover comprises coupling the cover to the supporting member at a distance above the supporting member substantially less than a width of the particle.

190. The method of claim 161, wherein the supporting member comprises a dry film photoresist material.

191. The method of claim 161, wherein the supporting member comprises a plurality of layers of a dry film photoresist material.

192. The method of claim 161, wherein forming the cavity comprises:

etching a first opening through a first dry film photoresist layer, the first opening having a width substantially less than a width of the particle;

placing a second dry film photoresist layer upon the first dry film photoresist layer;

etching a second opening through the second dry film photoresist layer, the second opening being substantially aligned with the first opening, wherein a width of the second opening is substantially greater than the width of the first opening;

wherein the second dry film photoresist layer comprises a thickness substantially greater than a width of the particle;

and further comprising forming a reflective layer upon the inner surface of the cavity.

193. The method of claim 161, wherein the supporting material comprises a plastic material.

194. The method of claim 161, wherein the supporting material comprises a plastic material, and wherein the cavity is formed by drilling the supporting material.

195. The method of claim 161, wherein the supporting material comprises a plastic material, and wherein the cavity is formed by transfer molding the supporting member.

196. The method of claim 161, wherein the supporting material comprises a plastic material, and wherein the cavity is formed by a punching device.

197. A method of sensing an analyte in a fluid comprising:

passing a fluid over a sensor array, the sensor array comprising at least one particle positioned within a cavity of a supporting member;

monitoring a spectroscopic change of the particle as the fluid is passed over the sensor array, wherein the spectroscopic change is caused by the interaction of the analyte with the particle.

198. The method of claim 197, wherein the spectroscopic change comprises a change in absorbance of the particle.

199. The method of claim 197, wherein the spectroscopic change comprises a change in fluorescence of the particle.

200. The method of claim 197, wherein the spectroscopic change comprises a change in phosphorescence of the particle.

201. The method of claim 197, wherein the analyte is a proton atom, and wherein the spectroscopic change is produced when the pH of the fluid is varied, and wherein monitoring the spectroscopic change of the particle allows the pH of the fluid to be determined.

202. The method of claim 197, wherein the analyte is a metal cation, and wherein the spectroscopic change is produced in response to the presence of the metal cation in the fluid.

203. The method of claim 197, wherein the analyte is an anion, and wherein the spectroscopic change is produced in response to the presence of the anion in the fluid.

204. The method of claim 197, wherein the analyte is a DNA molecule, and wherein the spectroscopic change is produced in response to the presence of the DNA molecule in the fluid.

205. The method of claim 197, wherein the analyte is a protein, and wherein the spectroscopic change is produced in response to the presence of the protein in the fluid.

206. The method of claim 197, wherein the analyte is a metabolite, and wherein the spectroscopic change is produced in response to the presence of the metabolite in the fluid.

207. The method of claim 197, wherein the analyte is a sugar, and wherein the spectroscopic change is produced in response to the presence of the sugar in the fluid.

208. The method of claim 197, wherein the analyte is a bacteria, and wherein the spectroscopic change is produced in response to the presence of the bacteria in the fluid.

209. The method of claim 197, wherein the particle comprises a receptor coupled to a polymeric resin, and further comprising exposing the particle to an indicator prior to passing the fluid over the sensor array.

210. The method of claim 197, wherein the particle comprises a receptor coupled to a polymeric resin, and further comprising exposing the particle to an indicator prior to passing the fluid over the sensor array, and wherein a binding strength of the indicator to the receptor is less than a binding strength of the analyte to the receptor.

211. The method of claim 197, wherein the particle comprises a receptor coupled to a polymeric resin, and further comprising exposing the particle to an indicator prior to passing the

fluid over the sensor array, and wherein the indicator is a fluorescent indicator.

212. The method of claim 197, further comprising treating the fluid with an indicator prior to passing the fluid over the sensor array, wherein the indicator is configured to couple with the analyte.

213. The method of claim 197, wherein the analyte is bacteria and further comprising breaking down the bacteria prior to passing the fluid over the sensor array.

214. The method of claim 197, wherein monitoring the spectroscopic change is performed with a CCD device.

215. The method of claim 197, further comprising measuring the intensity of the spectroscopic change, and further comprising calculating the concentration of the analyte based on the intensity of the spectroscopic change.

216. The method of claim 197, wherein the supporting member comprises silicon.

217. The method of claim 197, wherein the spectroscopic change comprises a change in reflectance of the particle.

218. The method of claim 197, wherein the cavity is configured such that the fluid entering the cavity passes through the supporting member.

219. The method of claim 197, wherein monitoring the spectroscopic change comprises:

directing a red light source at the particle;

detecting the absorbance of red light by the particle;

directing a green light source at the particle;

detecting the absorbance of green light by the particle;

directing a blue light source at the particle; and

detecting the absorbance of blue light by the particle.

220. The method of claim 197, wherein the sensor array further comprises a vacuum chamber coupled to a conduit and the sensor array , and wherein the chamber is configured to provide a pulling force on the fluid in the sensor array.

221. The method of claim 197, wherein the fluid is blood.

222. The method of claim 197, further comprising passing the fluid through a filter prior to passing the fluid over the sensor array.

223. The method of claim 197, further comprising passing the fluid through a reagent reservoir prior to passing the fluid over the sensor array.

224. The method of claim 197, wherein the particles are initially stored in a buffer, and further comprising removing the buffer prior to passing the fluid over the sensor array.

225. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal.

226. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer

coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the signal comprises an absorbance of the particle.

227. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the signal comprises a fluorescence of the particle.

228. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the signal comprises a phosphorescence of the particle.

229. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the chemical reaction comprises cleavage of the biopolymer induced by the analyte.

230. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the biopolymer comprises a peptide, and wherein the analyte comprises a protease, and wherein the chemical reaction comprises cleavage of the peptide b y the protease.

231. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the biopolymer comprises a polynucleotide, and wherein the analyte comprises a nuclease, and wherein the chemical reaction

comprises cleavage of the polynucleotide by the nuclease.

232. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the biopolymer comprises an oligosaccharide, and wherein the analyte comprises an oligosaccharide cleaving agent, and wherein the chemical reaction comprises cleavage of the oligosaccharide by the oligosaccharide cleaving agent.

233. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises a first indicator and a second indicator, the first and second indicators being coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the alteration of the signal is produced.

234. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises a first indicator and a second indicator, the first and second indicators being coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the alteration of the signal is produced, and wherein the first indicator is a fluorescent dye and wherein the second indicator is a fluorescent quencher, and wherein the first indicator and the second indicator are within the Föster energy transfer radius, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the first and second indicators to move outside the Föster energy transfer radius such that the alteration of the signal is produced.

235. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the particle further comprises a first indicator and a second indicator, the first and second indicators being coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the alteration of the signal is produced, and wherein the first indicator is a fluorescent dye and wherein the second indicator is a different fluorescent dye, and wherein the first indicator and the second indicator produce a fluorescence resonance energy transfer signal, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the positions of the first and second indicators to change such that the fluorescence resonance energy transfer signal is altered producing the alteration in the signal.

236. The method of claim 197, wherein the particle comprises a polymeric resin, a biopolymer coupled to the polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and further comprising an indicator coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the biopolymer to be cleaved such that a portion of the biopolymer coupled to the indicator is cleaved from a portion of the biopolymer coupled to the polymeric resin.

237. The method of claim 197, wherein the particle comprises a receptor coupled to a polymeric resin, and a probe molecule coupled to the polymeric resin, and wherein the probe molecule is configured to produce a signal when the receptor interacts with the analyte during use.

238. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use.

239. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker and wherein the indicator is coupled to the polymeric resin by a second linker.

240. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker and wherein the indicator is coupled to the polymeric resin by a second linker, and wherein the particle further comprises an additional indicator coupled to the polymeric resin by a third linker, wherein the interaction of the receptor with the analyte causes the indicator and the additional indicator to interact such that the signal is produced.

241. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker and wherein the indicator is coupled to the receptor.

242. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker and wherein the indicator is coupled to the receptor, and wherein the particle further comprises an additional indicator coupled to the receptor, wherein the interaction of the receptor with the analyte causes the indicator and the additional indicator to interact such that the signal is produced.

243. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the

receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker and wherein the indicator is coupled to the receptor by a second linker.

244. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker and wherein the indicator is coupled to the receptor by a second linker, and wherein the particle further comprises an additional indicator coupled to the receptor, wherein the interaction of the receptor with the analyte causes the indicator and the additional indicator to interact such that the signal is produced.

245. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker and wherein the indicator is coupled to the first linker.

246. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker, and wherein the indicator is coupled to the first linker by a second linker.

247. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker, and wherein the indicator is coupled to the first linker by a second linker, and wherein the particle further comprises an additional indicator coupled to the receptor, wherein the interaction of the receptor with the analyte causes the indicator and the

additional indicator to interact such that the signal is produced.

248. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the receptor is coupled to the polymeric resin by a first linker, and wherein the indicator is coupled to the first linker by a second linker, and wherein the particle further comprises an additional indicator coupled to the first linker by a third linker, wherein the interaction of the receptor with the analyte causes the indicator and the additional indicator to interact such that the signal is produced.

249. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the indicator interacts with the receptor in the absence of an analyte.

250. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the particle further comprises an additional indicator coupled to the polymeric resin, and wherein the indicator is a first fluorescent dye and wherein the additional indicator is a second fluorescent dye, and wherein the indicator and the additional indicator produce a fluorescence resonance energy transfer signal, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the fluorescence resonance energy transfer signal is altered.

251. The method of claim 197, wherein the particle comprises a receptor and an indicator coupled to a polymeric resin, wherein the indicator is configured to produce a signal when the receptor interacts with the analyte during use, and wherein the particle further comprises an additional indicator coupled to the polymeric resin, wherein the indicator is a fluorescent dye and

wherein the additional indicator is a fluorescence quencher, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the indicator is at least partially quenched by the additional indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the indicator by the additional indicator is altered.

252. The method of claim 197, wherein the particle comprises a biopolymer coupled to a polymeric resin, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte to produce a signal, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte such that the signal is altered.

253. A particle for detecting an analyte in a fluid comprising:

a polymeric resin;

a biopolymer coupled to the polymeric resin; and

an indicator system coupled to the biopolymer, the indicator system producing a signal, and wherein the biopolymer undergoes a chemical reaction in the presence of the analyte such that the signal is altered.

254. The particle of claim 253, wherein the particle ranges from about 0.05 micron to about 500 microns.

255. The particle of claim 253, wherein a volume of the particle changes when contacted with the fluid.

256. The particle of claim 253, wherein the chemical reaction comprises cleavage of the biopolymer by the analyte.

257. The particle of claim 253, wherein the biopolymer comprises a peptide, and wherein the analyte comprises a protease, and wherein the chemical reaction comprises cleavage of the peptide by the protease.

258. The particle of claim 253, wherein the biopolymer comprises a polynucleotide, and wherein the analyte comprises a nuclease, and wherein the chemical reaction comprises cleavage of the polynucleotide by the nuclease.

259. The particle of claim 253, wherein the biopolymer comprises an oligosaccharide, and wherein the analyte comprises an oligosaccharide cleaving agent, and wherein the chemical reaction comprises cleavage of the oligosaccharide by the oligosaccharide cleaving agent.

260. The particle of claim 253, wherein the particle indicator system comprises a first indicator and a second indicator, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the signal is produced.

261. The particle of claim 253, wherein the first indicator is a fluorescent dye and wherein the second indicator is a fluorescent quencher, and wherein the first indicator and the second indicator are within the Föster energy transfer radius, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the first and second indicators to move outside the Föster energy transfer radius.

262. The particle of claim 253, wherein the first indicator is a fluorescent dye and wherein the second indicator is a different fluorescent dye, and wherein the first indicator and the second indicator produce a fluorescence resonance energy transfer signal, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the positions of the first and second indicators to change such that the fluorescence resonance energy transfer signal is altered.

263. The particle of claim 253, wherein the indicator system comprises at least one indicator coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the biopolymer to be cleaved such that a portion of the biopolymer coupled to the indicator is cleaved from a portion of the biopolymer coupled to the polymeric resin.

264. A particle for detecting an analyte in a fluid comprising:

a polymeric resin;

a receptor coupled to the polymeric resin; and

a probe molecule coupled to the biopolymer, the probe molecule configured to produce a signal when the receptor interacts with the analyte during use.

265. The particle of claim 264, wherein the analyte comprises a metal ion, and wherein the probe molecule produces the signal in response to the interaction of the metal ion with the receptor.

266. The particle of claim 264, wherein the particles further comprises an additional probe molecule coupled to the polymeric resin, wherein the interaction of the receptor with the analyte causes the probe molecules to interact such that the signal is produced.

267. The particle of claim 264, wherein the receptor comprises a polynucleotide.

268. The particle of claim 264, wherein the receptor comprises a peptide.

269. The particle of claim 264, wherein the receptor comprises an enzyme.

270. The particle of claim 264, wherein the receptor comprises a synthetic receptor.

271. The particle of claim 264, wherein the receptor comprises an unnatural biopolymer.

272. The particle of claim 264, wherein the receptor comprises an antibody.

273. The particle of claim 264, wherein the receptor comprises an antigen.

274. The particle of claim 264, wherein the analyte comprises phosphate functional groups, and wherein the particle is configured to produce the signal in the presence of the phosphate functional groups.

275. The particle of claim 264, wherein the analyte comprises bacteria, and wherein the particle is configured to produce the signal in the presence of the bacteria.

276. The particle of claim 264, wherein the receptor comprises an antibody, an aptamer, an organic receptor, or an enzyme.

277. The particle of claim 264, wherein the probe molecule comprises an indicator, a dye, a quantum particle, or a semi-conductor particle.

278. A particle for detecting an analyte in a fluid comprising:

a polymeric resin;

a receptor coupled to the polymeric resin by a first linker; and

an indicator coupled to the first linker, the indicator configured to produce a signal when the receptor interacts with the analyte during use.

279. The particle of claim 278, wherein the receptor comprises a polynucleotide.

280. The particle of claim 278, wherein the receptor comprises a peptide.

281. The particle of claim 278, wherein the receptor comprises a compound of the general formula:

$$(R^1)_n - X - (R^2)_m$$

wherein X comprises carbocyclic systems or $C_1$-$C_{10}$ alkanes, n is an integer of at least 1, m is an integer of at least 1; and

wherein each of $R^1$ independently represents $-(CH_2)_y-NR^3-C(NR^4)-NR^5$, $-(CH_2)_y-NR^6R^7$, $-(CH_2)_y-NH-Y$, $-(CH_2)_y-O-Z$;
where y is an integer of at least 1;
where $R^3$, $R^4$, and $R^5$ independently represent hydrogen, alkyl, aryl, alkyl carbonyl of 1 to 10 carbon atoms, or alkoxy carbonyl of 1 to 10 carbon atoms, or $R^4$ and $R^5$ together represent a cycloalkyl group;
where $R^6$ represents hydrogen, alkyl, aryl, alkyl carbonyl of 1 to 10 carbon atoms, or alkoxy carbonyl of 1 to 10 carbon atoms;
where $R^7$ represents alkyl, aryl, alkyl carbonyl of 1 to 10 carbon atoms, or alkoxy carbonyl of 1 to 10 carbon atoms;
where $R^6$ and $R^7$ together represent a cycloalkyl group;
where Y is a peptide, or hydrogen
and where Z is a polynucleotide, an oligosaccharide or hydrogen; and

wherein each of $R^2$ independently represents hydrogen, alkyl, alkenyl, alkynyl, phenyl, phenylalkyl, arylalkyl, aryl, or together with another $R^2$ group represent a carbocyclic

ring.

282. The particle of claim 278, wherein the receptor comprises an enzyme.

283. The particle of claim 278, wherein the receptor is coupled to the first linker by a second linker and wherein the indicator is coupled to the first linker by a third linker.

284. The particle of claim 278, wherein the receptor is coupled to the first linker by a second linker and wherein the indicator is coupled to the first linker by a third linker, and wherein the indicator interacts with the receptor in the absence of an analyte.

285. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the first linker, wherein the interaction of the receptor with the analyte causes the indicator and the additional indicator to interact such that the signal is produced.

286. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the receptor, wherein the interaction of the receptor with the analyte causes the indicator and the additional indicator to interact such that the signal is produced.

287. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the first linker, and wherein the indicator is a first fluorescent dye and wherein the additional indicator is a second fluorescent dye, and wherein the indicator and the additional indicator produce a fluorescence resonance energy transfer signal, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the fluorescence resonance energy transfer signal is altered.

288. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the first linker, wherein the indicator is a fluorescent dye and wherein the additional indicator is a fluorescence quencher, and wherein the indicator and the additional indicator are

positioned such that the fluorescence of the indicator is at least partially quenched by the additional indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the indicator by the additional indicator is altered.

289. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the first linker, wherein the indicator is a fluorescence quencher and wherein the additional indicator is a fluorescent dye, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the additional indicator is at least partially quenched by the indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the additional indicator by the indicator is altered.

290. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the receptor, and wherein the indicator is a first fluorescent dye and wherein the additional indicator is a second fluorescent dye, and wherein the indicator and the additional indicator produce a fluorescence resonance energy transfer signal, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the fluorescence resonance energy transfer signal is altered.

291. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the receptor, wherein the indicator is a fluorescent dye and wherein the additional indicator is a fluorescence quencher, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the indicator is at least partially quenched by the additional indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the indicator by the additional indicator is altered.

292. The particle of claim 278, wherein the particle further comprises an additional indicator

coupled to the receptor, wherein the indicator is a fluorescence quencher and wherein the additional indicator is a fluorescent dye, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the additional indicator is at least partially quenched by the indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the additional indicator by the indicator is altered.

293. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the first linker, wherein the receptor is coupled to the first linker by a second linker, the indicator is coupled to the first linker by a third linker and the additional indicator is coupled to the first linker by a fourth linker, and wherein the indicator is a first fluorescent dye and wherein the additional indicator is a second fluorescent dye, and wherein the indicator and the additional indicator produce a fluorescence resonance energy transfer signal, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the fluorescence resonance energy transfer signal is altered.

294. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the first linker, wherein the receptor is coupled to the first linker by a second linker, the indicator is coupled to the first linker by a third linker and the additional indicator is coupled to the first linker by a fourth linker, wherein the indicator is a fluorescent dye and wherein the additional indicator is a fluorescence quencher, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the indicator is at least partially quenched by the additional indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the indicator by the additional indicator is altered.

295. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the first linker, wherein the receptor is coupled to the first linker by a second linker,

the indicator is coupled to the first linker by a third linker and the additional indicator is coupled to the first linker by a fourth linker, wherein the indicator is a fluorescence quencher and wherein the additional indicator is a fluorescent dye, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the additional indicator is at least partially quenched by the indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the additional indicator by the indicator is altered.

296. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the receptor, wherein the receptor is coupled to the first linker by a second linker, the indicator is coupled to the first linker by a third linker and the additional indicator is coupled to the receptor by a fourth linker, and wherein the indicator is a first fluorescent dye and wherein the additional indicator is a second fluorescent dye, and wherein the indicator and the additional indicator produce a fluorescence resonance energy transfer signal, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the fluorescence resonance energy transfer signal is altered.

297. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the receptor, wherein the receptor is coupled to the first linker by a second linker, the indicator is coupled to the first linker by a third linker and the additional indicator is coupled to the receptor by a fourth linker, wherein the indicator is a fluorescent dye and wherein the additional indicator is a fluorescence quencher, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the indicator is at least partially quenched by the additional indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the indicator by the additional indicator is altered.

298. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the receptor, wherein the receptor is coupled to the first linker by a second linker, the

indicator is coupled to the first linker by a third linker and the additional indicator is coupled to the receptor by a fourth linker, wherein the indicator is a fluorescent dye and wherein the additional indicator is a fluorescence quencher, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the indicator is at least partially quenched by the additional indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the indicator by the additional indicator is altered.

299. The particle of claim 278, wherein the particle further comprises an additional indicator coupled to the receptor, wherein the receptor is coupled to the first linker by a second linker, the indicator is coupled to the first linker by a third linker and the additional indicator is coupled to the receptor by a fourth linker, wherein the indicator is a fluorescence quencher and wherein the additional indicator is a fluorescent dye, and wherein the indicator and the additional indicator are positioned such that the fluorescence of the additional indicator is at least partially quenched by the indicator, and wherein the interaction of the analyte with the receptor causes the distance between the indicator and the additional indicator to become altered such that the quenching of the fluorescence of the additional indicator by the indicator is altered.

300. The particle of claim 278, wherein the polymeric resin comprises polystyrene-polyethylene glycol-divinyl benzene.

301. A particle for detecting an analyte in a fluid comprising:

a polymeric resin;

a biopolymer coupled to the polymeric resin; and

an indicator system coupled to the biopolymer, the indicator system producing a signal during use, and wherein the biopolymer undergoes a chemical reaction in the

presence of the analyte such that the signal is altered during use.

302. The particle of claim 301, wherein the chemical reaction comprises cleavage of at least a portion of the biopolymer by the analyte.

303. The particle of claim 301, wherein the biopolymer comprises a polynucleotide, and wherein the analyte comprises a nuclease, and wherein the chemical reaction comprises cleavage of at least a portion of the polynucleotide by the nuclease.

304. The particle of claim 301, wherein the biopolymer comprises an oligosaccharide, and wherein the analyte comprises an oligosaccharide cleaving agent, and wherein the chemical reaction comprises cleavage of at least a portion of the oligosaccharide by the oligosaccharide cleaving agent.

305. The particle of claim 301, wherein the particle indicator system comprises a first indicator and a second indicator, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes a distance between the first and second indicators to become altered such that the signal is produced.

306. The particle of claim 689, wherein the first indicator is a fluorescent dye and wherein the second indicator is a fluorescence quencher, and wherein the first indicator and the second indicator are positioned such that the fluorescence of the first indicator is at least partially quenched by the second indicator, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the first and second indicators to move such that the quenching of the fluorescence of the first indicator by the second indicator is altered.

307. The particle of claim 689, wherein the first indicator is a fluorescent dye and wherein the second indicator is a different fluorescent dye, and wherein the first indicator and the second indicator produce a fluorescence resonance energy transfer signal, and wherein the chemical

reaction of the biopolymer in the presence of the analyte causes the positions of the first and second indicators to change such that the fluorescence resonance energy transfer signal is altered.

308. The particle of claim 301, wherein the indicator system comprises at least one indicator coupled to the biopolymer, and wherein the chemical reaction of the biopolymer in the presence of the analyte causes the biopolymer to be cleaved such that at least a portion of the biopolymer coupled to the indicator is cleaved from at least a portion of the biopolymer coupled to the polymeric resin.

309. A method of forming a sensor array for detecting an analyte in a fluid, comprising:

depositing a mask on a substrate;

forming an opening in the mask to expose a portion of the substrate;

etching the exposed portion of the substrate to form a cavity in the substrate, wherein a portion of the substrate under the mask is etched to form flexible projections positioned over a portion of the cavity; and

inserting a particle into the cavity, wherein the flexible projections substantially inhibit removal of the particle from the cavity, and wherein a particle, the particle positioned within the cavity, wherein the particle is configured to produce a signal when the particle interacts with the analyte during use.

310. The method of claim 0, wherein the mask comprises silicon nitride.

311. The method of claim 0, wherein the substrate comprises a bulk crystalline (100) silicon substrate.

312. The method of claim 0, wherein an area of the opening formed in the mask is smaller than an area of a top opening of the cavity in the substrate.

313. The method of claim 0, wherein the opening formed in the mask comprises a square.

314. The method of claim 0, wherein the opening formed in the mask comprises a circle.

315. The method of claim 0, wherein the opening formed in the mask comprises a cross.

316. The method of claim 0, wherein the opening formed in the mask comprises a star.

317. The method of claim 0, wherein the opening formed in the mask comprises slits.

318. The method of claim 0, wherein the mask comprises a plastic.

319. The method of claim 0, wherein the cavity comprises a bottom opening.

320. The method of claim 0, wherein the substrate allows fluid flow through the cavity.

321. The method of claim 0, wherein the cavity comprises a bottom opening configured to allow passage of a particle smaller than the bottom opening through the cavity.

322. The method of claim 0, wherein the cavity comprises a bottom opening configured to inhibit a particle larger than the bottom opening from passing through the cavity.

323. The method of claim 0, wherein a top opening and a bottom opening of the cavity provide selection of the particle substantially contained in the cavity.

324. The method of claim 0, wherein the cavity comprises a top opening configured to inhibit a particle larger than the top opening from passing into the cavity through the flexible projections.

325. The method of claim 0, wherein the cavity comprises a top opening configured to allow a particle smaller than the top opening into the cavity through the flexible projections.

326. The method of claim 0, wherein the particle is smaller than a top opening and larger than a bottom opening of the cavity.

327. The method of claim 0, further comprising forming a plurality of cavities in the substrate.

328. The method of claim 0, wherein from about 10 to about $10^6$ cavities are formed in the substrate.

329. The method of claim 0, further comprising providing a plurality of particles to the substrate.

330. The method of claim 0, further comprising inserting a plurality of particles in a plurality of cavities in the substrate.

331. The method of claim 0, further comprising directing a solution of particles towards a top opening of the cavity, wherein the particle of desired size is transferred into the cavity.

332. The method of claim 0, further comprising exposing the particle to a medium to shrink the particle for insertion into the cavity, wherein swelling of the particle after insertion into the cavity substantially contains the particle within the cavity.

333. The method of claim 0, wherein the flexible projections exhibit an elastic behavior, and wherein the flexible projections bend downward to allow insertion of the particle into the cavity, and wherein the flexible projections return upward to substantially contain the particle in the cavity.

334. The method of claim 0, wherein anisotropically etching the substrate comprises etching a bulk crystalline (100) silicon substrate to the (111) planes in the substrate.

335. The method of claim 0, wherein the mask comprises silicon dioxide.

336. The method of claim 0, wherein the mask comprises a dry film photoresist material.

337. The method of claim 0, further comprising illuminating the particle with a light source, wherein the flexible projections are transparent to light generated by the light source.

338. The method of claim 0, wherein the flexible projections are configured to elastically bend into the cavity in the substrate.

339. The method of claim 0, further comprising depositing a second mask, the second mask configured to inhibit the flexible projections bending from an initial position to a position away from the cavity.

340. The method of claim 0, wherein inserting the particle into the cavity comprises using airflow to pull the particle through the flexible projections.

341. The method of claim 0, wherein inserting the particle into the cavity comprises electrically actuating the flexible projections to allow insertion of the particle into the cavity.

342. A sensor array for detecting an analyte in a fluid, comprising:

a substrate, wherein the substrate comprises at least one cavity;

a particle positioned within the cavity, wherein the particle is configured to produce a signal upon interaction with the analyte; and

a flexible projection positioned over a portion of the cavity, wherein the flexible projection is configured to substantially inhibit displacement of the particle during use.

343. The sensor array of claim 342, wherein the particle comprises a receptor molecule coupled to a polymeric resin.

344. The sensor array of claim 342, wherein the particle has a size ranging from about 0.05 microns to about 500 microns in diameter.

345. The sensor array of claim 342, wherein the cavity is configured to substantially contain the particle.

346. The sensor array of claim 342, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are removable.

347. The sensor array of claim 342, wherein an opening is formed in the bottom of the cavity, wherein the opening is configured such that the fluid flows through the cavity and out of the cavity through the opening during use.

348. The sensor array of claim 342, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the bottom layer is coupled to a bottom surface of the substrate and wherein the cover layer is removable, and wherein the cover layer and the bottom layer include openings that are substantially aligned with the cavities during use.

349. The sensor array of claim 342, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein an opening is formed in the cover layer substantially aligned with the cavity, and wherein an opening is formed in the bottom layer substantially aligned with the cavity.

350. The sensor array of claim 342, wherein the cavity is tapered such that the width of the

cavity narrows in a direction from a top surface of the substrate toward a bottom surface of the substrate, and wherein a minimum width of the cavity is substantially less than a width of the particle.

351. The sensor array of claim 342, wherein a width of a bottom portion of the cavity is substantially less than a width of a top portion of the cavity, and wherein the width of the bottom portion of the cavity is substantially less than a width of the particle.

352. The sensor array of claim 342, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the bottom layer is configured to support the particle, and wherein an opening is formed in the cover layer substantially aligned with the cavity.

353. The sensor array of claim 342, further comprising a removable cover layer coupled to the substrate.

354. The sensor array of claim 342, wherein the substrate comprises a plastic material.

355. The sensor array of claim 342, wherein the substrate comprises a silicon wafer.

356. The sensor array of claim 342, wherein the substrate comprises a dry film photoresist material.

357. The sensor array of claim 342, wherein the substrate comprises a plurality of layers of a dry film photoresist material.

358. The sensor array of claim 342, wherein an inner surface of the cavity is coated with a reflective material.

359. The sensor array of claim 342, further comprising channels in the substrate, wherein the channels are configured to allow the fluid to flow through the channels into and away from the cavity.

360. The sensor array of claim 342, further comprising a plurality of additional particles positioned within a plurality of additional cavities in the substrate.

361. The sensor array of claim 342, further comprising a plurality of additional flexible projections positioned over a plurality of additional cavities in the substrate.

362. The sensor array of claim 342, further comprising a cover layer coupled to the substrate, wherein the flexible projection is formed in the cover layer.

363. The sensor array of claim 342, wherein the flexible projection comprises silicon nitride.

364. The sensor array of claim 342, wherein the flexible projection comprises a plastic.

365. The sensor array of claim 342, wherein the flexible projection is configured to retain the particle in the cavity.

366. The sensor array of claim 342, wherein a top opening and a bottom opening of the cavity provides selection of the particle substantially contained in the cavity.

367. The sensor array of claim 342, wherein a size of the particle is smaller than a top opening of the cavity and larger than a bottom opening of the cavity such that the particle will be substantially contained in the cavity.

368. The sensor array of claim 342, wherein the particle is positioned within the cavity by using airflow to pull the particle through the flexible projection.

369. The sensor array of claim 342, wherein the flexible projection comprises silicon dioxide.

370. The sensory array of claim 342, further comprising a light source, wherein the flexible projection is transparent to light generated by the light source.

371. The sensor array of claim 342, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are transparent to light generated by a light source.

372. The sensor array of claim 342, wherein the flexible projection is configured to elastically bend into the cavity in the substrate.

373. The sensor array of claim 342, further comprising a mask, the mask configured to inhibit the flexible projection bending from an initial position to a position away from the cavity.

374. The sensor array of claim 342, wherein the flexible projection is electrically actuated to allow insertion of the particle into the cavity.

375. A method for forming a sensor array for selecting a particle, comprising:

depositing a mask on a substrate;

forming an opening in the mask to expose a portion of the substrate;

anisotropically etching the exposed portion of the substrate to form a cavity in the substrate, wherein the cavity comprises a top opening and a bottom opening; and

inserting a particle into the cavity, wherein a diameter of the particle is smaller than the top opening of the cavity, and wherein the diameter of the particle is larger than the bottom opening of the cavity, wherein the particle is configured to produce a signal when the particle interacts with the analyte during use.

376. The method of claim 375, wherein the mask comprises silicon nitride.

377. The method of claim 375, wherein the mask comprises a plastic.

378. The method of claim 375, wherein the mask comprises a dry film photoresist material.

379. The method of claim 375, wherein the mask comprises a plurality of dry film photoresist materials.

380. The method of claim 375, wherein the substrate comprises silicon.

381. The method of claim 375, wherein the substrate comprises plastic.

382. The method of claim 375, wherein the substrate comprises a plurality of layers of dry film photoresist material.

383. The method of claim 375, wherein forming the opening in the mask comprises etching the mask.

384. The method of claim 375, wherein forming the opening in the mask comprises cutting the mask.

385. The method of claim 375, wherein anisotropically etching the substrate comprises etching a bulk crystalline (100) silicon substrate to the (111) planes in the substrate with a Group 1A metal hydroxide solution.

386. The method of claim 375, further comprising forming a plurality of additional openings in the mask.

387. The method of claim 375, further comprising forming a plurality of additional cavities in the substrate.

388. The method of claim 375, further comprising a plurality of additional openings in the mask positioned over a plurality of additional cavities formed in the substrate.

389. The method of claim 375, wherein a size of the top opening of the cavity is controlled independently of a size of bottom opening of the cavity.

390. The method of claim 375, wherein the bottom opening of the cavity provides retention of a particle with a diameter larger than the bottom opening and allows passage of a particle with a diameter smaller than the bottom opening through the bottom opening.

391. The method of claim 375, wherein inserting a particle into the cavity comprises placement of the particle by micromanipulators.

392. The method of claim 375, further comprising flowing a solution of particles over the substrate.

393. The method of claim 375, further comprising flowing a solution of particles over the cavity formed in the substrate.

394. The method of claim 375, further comprising flowing a solution of particles over a plurality of additional cavities in the substrate.

395. The method of claim 375, further comprising flowing a solution of particles over the substrate by applying a vacuum to the solution of particles.

396. The method of claim 375, wherein inserting a particle into the cavity comprises inserting a plurality of particles into a plurality of cavities.

397. The method of claim 375, wherein inserting the particle into the cavity comprises using airflow to pull the particle into the cavity.

398. The method of claim 375, further comprising illuminating the particle with a light source, wherein the mask is transparent to light generated by the light source.

399. A sensor array for selecting a particle comprising:

a substrate, wherein the substrate comprises at least one cavity, the cavity comprising;

a top opening; and

a bottom opening;

wherein the cavity is configured to allow fluid to pass through the substrate through the top opening and the bottom opening of the cavity; and

a particle positioned within the cavity, wherein the particle is configured to produce a signal when the particle interacts with the analyte during use; and wherein a diameter of the particle is smaller than the top opening of the cavity, and wherein the diameter of the particle is larger than the bottom opening of the cavity.

400. The sensor array of claim 399, wherein the substrate comprises a silicon wafer.

401. The sensor array of claim 399, wherein the substrate comprises a plastic.

402. The sensor array of claim 399, wherein the substrate comprises a dry film photoresist material.

403. The sensor array of claim 399, wherein the substrate comprises a plurality of dry film photoresist material.

404. The sensor array of claim 399, wherein the at least one cavity comprises a plurality of cavities in the substrate.

405. The sensor array of claim 399, wherein the particle comprises a diameter from about 0.05 micron to about 500 microns.

406. The sensor array of claim 399, wherein a too small particle will pass out of the bottom opening of the cavity.

407. The sensor array of claim 399, wherein a too large particle will be rejected from entering the top opening of the cavity.

408. The sensor array of claim 399, wherein the substrate comprises a (100) silicon substrate, and wherein walls of the cavity of the substrate comprise (111) planes of the silicon substrate.

409. The sensor array of claim 399, wherein the cavity comprises a width from about 0.05 microns to about 500 microns.

410. The sensor array of claim 399, wherein the cavity is tapered such that a width of the cavity narrows in a direction from a top surface of the substrate toward a bottom surface of the substrate, and wherein a minimum width of the cavity is substantially less than a width of the particle.

411. The sensor array of claim 399, wherein the cavity is tapered such that a minimum width of the top opening is substantially greater than a maximum width of the particle.

412. The sensor array of claim 399, further comprising channels in the substrate, wherein the channels are configured to allow the fluid to flow through the channels into and away from the cavity.

413. The sensor array of claim 399, further comprising a plurality of additional particles positioned within a plurality of additional cavities formed in the substrate.

414. The sensor array of claim 399, wherein the particle is positioned within the cavity using airflow to pull the particle into the cavity.

415. The sensor array of claim 399, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are removable.

416. The sensor array of claim 399, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are removable, and wherein the cover layer and the bottom layer include openings that are substantially aligned with the cavities during use.

417. The sensor array of claim 399, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the bottom layer is coupled to a bottom surface of the substrate and wherein the cover layer is removable, and wherein the cover layer and the bottom layer include openings that are substantially aligned with the cavities during use.

418. The sensor array of claim 399, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein an opening is formed in the cover layer substantially aligned with the cavity, and wherein an opening is formed in the bottom layer substantially aligned with the cavity.

419. The sensor array of claim 399, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the bottom layer is configured to support the particle, and wherein an opening is formed in the cover layer substantially aligned with the cavity.

420. The sensor array of claim 399, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are transparent to light generated by a light source.

421. The sensor array of claim 399, further comprising a cover layer, wherein the cover layer is transparent to light generated by a light source.

422. A sensor array for detecting a analytes in a fluid, comprising:

a substrate;

a first cavity formed in the substrate, the first cavity having a first top opening and a first bottom opening;

a second cavity formed in the substrate, the second cavity having a second top opening and a second bottom opening;

a first particle positioned in the first cavity having a first particle size, wherein the first particle is configured to produce a signal when the first particle interacts with an analyte during use;

a second particle positioned in the second cavity having a second particle size, wherein the second particle is configured to produce a signal when the second particle interacts with an analyte during use;

wherein the second particle size is greater than the first top opening and wherein the first particle size is less than the second bottom opening.

423. The sensor array of claim 422, wherein the first particle is configured to produce a first signal in the presence of a first analyte, and wherein the second particle is configured to produce a signal in the presence of a second analyte, wherein the first and second analytes are different.

424. The sensor array of claim 422, wherein the first and second particles comprise a receptor molecules coupled to a polymeric resin.

425. The sensor array of claim 422, wherein the size of the first and second particles ranges from about 0.05 microns to about 500 microns in diameter.

426. The sensor array of claim 422, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are removable.

427. The sensor array of claim 422, further comprising a substantially flexible projection positioned over a portion of the cavity, wherein the flexible projection is configured to substantially inhibit displacement of the particle during use.

428. The sensor array of claim 422, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the bottom layer is coupled to a bottom surface of the substrate and wherein the cover layer is removable, and wherein the cover layer and the bottom layer include openings that are substantially aligned with the cavities during use.

429. The sensor array of claim 422, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein openings formed in the cover layer are substantially aligned with the cavities, and wherein openings formed in the bottom layer are substantially aligned with the cavities.

430. The sensor array of claim 422, wherein the cavities are tapered such that the width of

each cavity narrows in a direction from a top surface of the substrate toward a bottom surface of the substrate.

431. The sensor array of claim 422, wherein a width of the bottom opening of the cavities is substantially less than a width of a top opening of the cavities.

432. The sensor array of claim 422, further comprising a removable cover layer coupled to the substrate.

433. The sensor array of claim 422, wherein the substrate comprises a plastic material.

434. The sensor array of claim 422, wherein the substrate comprises a silicon wafer.

435. The sensor array of claim 422, wherein the substrate comprises a dry film photoresist material.

436. The sensor array of claim 422, wherein the substrate comprises a plurality of layers of a dry film photoresist material.

437. The sensor array of claim 422, wherein an inner surface of the cavity is coated with a reflective material.

438. The sensor array of claim 422, further comprising channels in the substrate, wherein the channels are configured to allow the fluid to flow through the channels into and away from the cavities.

439. The sensor array of claim 422, further comprising a mask coupled to the upper surface of the substrate, and further comprising a flexible projection positioned over a portion of the cavity,

wherein the flexible projection is configured to substantially inhibit displacement of the particle during use, and wherein the flexible projections are formed in the mask.

440. The sensor array of claim 422, further comprising a flexible projection positioned over a portion of the cavity, wherein the flexible projection is configured to substantially inhibit displacement of the particle during use, and wherein the flexible projections comprise silicon nitride.

441. The sensor array of claim 422, further comprising a flexible projection positioned over a portion of the cavity, wherein the flexible projection is configured to substantially inhibit displacement of the particle during use, and wherein the flexible projections comprise a polymer.

442. The sensor array of claim 422, further comprising a flexible projection positioned over a portion of the cavity, wherein the flexible projection is configured to substantially inhibit displacement of the particle during use, and wherein the flexible projections comprise silicon dioxide.

443. The sensor array of claim 422, further comprising a flexible projection positioned over a portion of the cavity, wherein the flexible projection is configured to substantially inhibit displacement of the particle during use, and further comprising a light source, wherein the flexible projections are transparent to light generated by the light source.

444. The sensor array of claim 422, further comprising a cover layer coupled to the substrate and a bottom layer coupled to the substrate, wherein the cover layer and the bottom layer are transparent to light generated by a light source.

445. A method of forming a sensor array for detecting an analyte in a fluid, comprising:

forming a first and second cavity in a substrate, the first cavity has a first top opening and a first bottom opening, and wherein the second cavity has a second top opening and a second bottom opening; and

placing a mixture of a first and a second particle on the substrate, wherein the first particle has a first particle size, and wherein the first particle is configured to produce a signal when the first particle interacts with an analyte during use, and wherein the second particle has a second particle size, wherein the second particle is configured to produce a signal when the second particle interacts with an analyte during use, and wherein the second particle size is greater than the first top opening and wherein the first particle size is less than the second bottom opening;

inserting the particles into the cavities.

446. The method of claim 445, wherein placing a mixture of the particles on the substrate comprises directing a suspension of the particles toward the top openings of the cavities.

447. The method of claim 445, further comprising exposing the particles to a medium to shrink the particles for insertion into the plurality of cavities, and swelling the particles after insertion into the cavities by exposure to a different medium.

448. The method of claim 445, wherein forming the cavities in the substrate comprises anisotropically etching a silicon substrate.

449. The method of claim 445, further comprising depositing a mask on the substrate, and forming openings in the mask, wherein forming the cavities in the substrate comprises etching the substrate through the opening of the mask.

450. The method of claim 445, wherein inserting the particles into the cavities \ comprises pulling the particles through into the cavities using a vacuum.

451. A method of forming a sensor array, comprising:

depositing a mask on a substrate;

forming an opening in the mask to expose a portion of the substrate;

anisotropically etching the exposed portion of the substrate to form a cavity in the substrate, wherein the cavity comprises a top opening and a bottom opening;

undercutting the mask during etching of the substrate to form flexible projections positioned over the cavity such that the opening in the mask is smaller than the top opening of the cavity; and

inserting a particle into the cavity, wherein a diameter of the particle is smaller than the top opening of the cavity and larger than the bottom opening of the cavity, and wherein the flexible projections substantially contain the particle in the cavity.

452. A sensor array, comprising:

a substrate having at least one cavity, the cavity comprising:

a top opening; and

a bottom opening;

wherein the cavity is configured to allow fluid to pass through the substrate through the top opening and the bottom opening of the cavity;

a particle positioned within the cavity; and

a flexible projection positioned over the cavity;

wherein the flexible projection is configured to contain the particle in the cavity during use.

453. A method of sorting various sized particles, comprising:

depositing a mask on a substrate;

forming an opening in the mask to expose a portion of the substrate;

anisotropically etching the exposed portion of the substrate to form a cavity in the substrate, the cavity having a top opening larger than a bottom opening; and

pulling a solution of various sized particles through the substrate through the top opening and the bottom opening of the cavity of the substrate.

454. A device for sorting various sized particles, comprising:

a substrate having at least one cavity, the at least one cavity comprising:

a top opening; and

a bottom opening;

wherein the top opening of the cavity is larger than the bottom opening of the cavity; and

wherein the cavity is configured to allow fluid containing various sized particles to pass through the substrate through the top opening and the bottom opening of the at least one cavity during use.

455. A method of placing an array of particles on a target, comprising:

depositing a mask on a substrate;

forming a plurality of openings in the mask to expose portions of the substrate;

anisotropically etching the exposed portions of the substrate to form a plurality of cavities in the substrate, wherein the plurality of cavities having top openings larger than bottom openings;

pulling a solution of particles through the substrate through the top openings and the bottom openings of the plurality of cavities of the substrate;

positioning the substrate in a desired position over the target; and

dislodging particles captured in the cavities of the substrate onto the target.

456. A method of forming a check valve assembly, comprising:

depositing a first mask on a substrate;

forming a first opening in the first mask to expose a portion of the substrate;

anisotropically etching the exposed portion of the substrate to form a cavity in the substrate;

undercutting the first mask during etching of the substrate to form flexible projections positioned over the cavity;

forming a second opening in a second mask, wherein the second opening is positioned over the first opening in the first mask; and

inserting a particle into the cavity in the substrate through the flexible projections, wherein a diameter of the particle is larger than the second opening in the second mask and larger than a length of a bottom opening of the cavity, and wherein the diameter of the particle is smaller than a width of the bottom opening of the cavity.

457. A check valve assembly, comprising:

a substrate, wherein the substrate comprises a cavity;

a particle positioned in the cavity, wherein a diameter of the particle is larger than a top opening into the cavity and larger than a length of a bottom opening of the cavity, and wherein the diameter of the particle is smaller than a width of the bottom opening of the cavity; and

a flexible projection positioned over the cavity, wherein the flexible projection is configured to allow insertion of the particle in the cavity;

wherein fluid flow is allowed in a direction from the top opening through the bottom opening of the cavity, and wherein fluid flow is substantially inhibited in a reverse direction during use.

458. A method of forming a check valve assembly, comprising:

depositing a mask on a substrate;

forming slits in the mask;

anisotropically etching the substrate through the slits in the mask to form a cavity in the substrate, wherein the cavity comprises a top opening and a bottom opening; and

undercutting the mask during etching of the substrate to form flexible projections positioned over the cavity, wherein the flexible projections allow fluid flow in a direction from the top opening through the bottom opening of the cavity, and wherein the flexible projections substantially inhibit fluid flow in a reverse direction.

459. A check valve assembly, comprising:

a substrate, wherein the substrate comprises a cavity; and

a flexible projection positioned over a top opening of the cavity;

wherein the flexible projection allows fluid flow through the substrate in a direction from the top opening through a bottom opening of the cavity, and wherein the flexible projections substantially inhibit fluid flow in a reverse direction during use.